direction of travel that link that forms a minimum rotation angle in a selected direction with the currently known link.

REMARKS

This response addresses the Office Action mailed August 2, 2002.

I. Information Disclosure Statement

In the Office Action (¶ 1), an objection was made that a reference described in Applicant's specification was not listed in an information disclosure statement. To address this objection, a supplemental information disclosure statement that lists the reference mentioned in the specification has been filed with this response. The Examiner is respectfully requested to consider the information contained in the supplemental information disclosure statement. The Examiner is requested to acknowledge consideration of the information disclosure statement by initialing the appropriate location on the enclosed form PTO-1449.

Authorization for payment of the fee for consideration of this information disclosure statement is included with this response.

II. Drawings

In the Office Action (¶ 2), an objection was made to Applicant's Figures 6 and 7. According to the Office Action, certain features described in Applicant's specification were not labeled in these figures. As required by the Examiner, corrected drawing sheets that show Figures 6 and 7 are submitted with this response. The corrected drawings include labels corresponding to the features mentioned by the Examiner as described in Applicant's specification. Two sets of corrected drawings are included. In one set of corrected drawings, the added labels are shown in red. The second set of corrected drawings shows the added labels in black and is suitable for publication. Applicant requests the Examiner to accept these corrected drawings.

III. Specification

In the Office Action (¶¶ 3 and 4), the Examiner made several objections to the specification.

1. In the Office Action (¶ 3), the Examiner stated that the specification did not provide support for Applicant's Claim 10. Applicant respectfully disagrees with the Examiner and submits that Claim 10 is supported by the specification. Applicant refers the Examiner to the processes described in the specification at page 7, lines 12-27 and illustrated in FIG. 8. These portions of Applicant's disclosure fully support Claim 10, as filed. However, in the interest of advancing prosecution of the present application, Applicant has amended Claim 10 to more closely follow the language in the specification.

2. a. In the Office Action (¶ 4.a), the Examiner stated that the specification did not disclose the test for a point being on the left, right, or on a line segment as disclosed in FIG. 8. To address this objection, this response includes an amendment to the specification at page 7, lines 12-27 that adds the language from FIG. 8. No new matter has been added.

b. In the Office Action (¶ 4.b), the Examiner stated that the passage in Applicant's specification at page 7, line 14 should read *"If ae2 is on the right side of be1 or be2"* instead of *"If ae2 is on the right side of be1 and be2."* Since the location of ae2 is determined relative to the link defined by *"be1 and be2"*, the sentence is correct as it is. Accordingly, this passage of Applicant's specification has not been amended.

c. In the Office Action (¶ 4.c), the Examiner stated that the passage at page 8, lines 9-10 should read *"in the counterclockwise direction of the LINK(START) is the next link."* In order to address this objection, Applicant has amended this passage of the specification as follows: *"in the counterclockwise direction from LINK(START) is the next link."* This amendment is slightly different than the Examiner's suggestion, but expresses the same idea. Applicant respectfully requests the Examiner to approve the amendment.

IV. Claim objections

In the Office Action (¶ 5), the Examiner made an objection to Applicant's Claims 1 and 14. The Examiner also included a suggestion to address this objection. With this response, these claims have been amended to include the Examiner's suggestion.

V. Claim rejections – 35 U.S.C. 112, second paragraph

In the Office Action (¶¶ 6 and 7), Applicant's Claims 1-20 were rejected under 35 U.S.C. 112, second paragraph. These rejections are addressed as follows:

In the Office Action (¶ 7.a), the position was expressed that the passages *"a first known portion"* and *"a current known portion"* in Applicant's Claim 1 were not clear. Applicant maintains that Claim 1, as originally presented, fully complied with 35 U.S.C. 112, second paragraph. However, in order to make the language more clear, Applicant includes an amendment of Claim 1. With this amendment, the comments raised by the Examiner in the Office Action (¶ 7.a) have been addressed.

In the Office Action (¶ 7.b), the position was expressed that the passage *"selecting that portion of the boundary . . . and that forms a minimum rotation angle therewith"* was unclear because it did not cover the situation when there is only one portion that connects to the leading end of the current known portion, as explained in the specification at page 8, lines 4-7. Applicant respectfully disagrees. In the case in which there is only one portion that connects to the leading end of a current known portion, that one portion necessarily is the portion that forms the minimum rotation angle with the current known portion and therefore is selected.

In the Office Action (¶ 7.b), the position was expressed that the language *"minimum rotation angle therewith"* in Applicant's Claim 1 was ambiguous because the direction of rotation was not defined. Applicant respectfully disagrees that this language is ambiguous because one of ordinary skill would clearly understand the need to select a rotation direction. However, in the interest of addressing this issue, the present response includes an amendment of Claim 1 that adds the language *"in a selected direction"* to the claim.

In the Office Action (¶ 7.c), the rejections contained in ¶ 7.a and ¶ 7.b were applied to Applicant's Claims 14 and 18. Applicant has included amendments to Claims

14 and 18 that are similar to those made to Claim 1. Accordingly, with these amendments, the rejections of these claims have been addressed.

VI. Claim rejections – 35 U.S.C. 103

A. Applicant's Claims 1-4 and 7-17 are not obvious over Tanimori.

In the Office Action (¶¶ 8 and 9), Applicant's independent Claims 1 and 14 and dependent Claims 2-4, 7-13 and 15-17 were rejected as obvious over U.S. Pat. No. 5,179,645 ("Tanimori"). Applicant submits that these claims are not obvious over Tanimori and requests that the Examiner reconsider and withdraw the rejection. Applicant's reasons in support of this position are as follows.

Claim 1

Referring to Applicant's independent Claim 1, the position was expressed in the Office Action that Tanimori disclosed all the limitations of Applicant's independent Claim 1 except for the step of selecting the portion of the boundary that connects to the leading end of a known portion. According to the Office Action, this step would have been obvious because Tanimori discloses a different process that includes judging an angle direction of boundary portions.

The position expressed in the Office Action that Tanimori discloses all the limitations of Applicant's Claim 1 except for the step of selecting the portion of the boundary that connects to the leading end of a known portion is incorrect. Applicant's Claim 1 recites two steps. Substantial portions of both steps of Applicant's Claim 1 are not disclosed or suggested by Tanimori. Because substantial portions of Applicant's Claim 1 are not disclosed or suggested by Tanimori, Applicant's Claim 1 is not obvious over this reference. Applicant respectfully requests the Examiner to withdraw the rejection.

Applicant's Claim 1 relates to a method for determining the polygonal intersection of two polygons. In a first step, Applicant's Claim 1 recites *"determining"* a *"first portion"* of a *"boundary"* of a *"polygonal intersection"* as being comprised of the *"portion"* of the *"boundary"* of a *"first polygon"* *"located inside"* a *"second polygon"* at an *"intersection"* of the *"boundary"* of the *"first polygon"* with the *"boundary"* of the

"second polygon." In a second step, Applicant's Claim 1 recites *"determining"* each *"subsequent portion"* of the *"boundary"* of the *"polygonal intersection"* by *"selecting"* a *"portion"* of the *"boundary"* of either the *"first polygon"* or the *"second polygon"* that *"connects"* to a *"leading end"* of a *"portion"* of the *"boundary"* of the *"polygonal intersection"* that had *"previously been determined"* and that forms a *"minimum rotation angle therewith."*

Tanimori discloses the method of recognizing graphic objects that overlap by a designated degree (Tanimori: column 2, lines 1-6). To find overlapping graphic objects, Tanimori finds crosspoints (Tanimori: column 5, lines 53-60). According to Tanimori, the connecting relationship between the segments that make up the objects is changed (Tanimori: column 7, line 60-column 8, line 18; column 9, line 54-column 10, line 33). Then, graphic objects having a designated degree of overlapping are determined (Tanimori: column 11, line 28-column 12, line 12).

Tanimori fails to disclose or suggest substantial portions of both steps of Applicant's independent Claim 1. Regarding the first step of Applicant's Claim 1, Tanimori does not disclose *"determining"* a *"first portion"* of a *"boundary"* of a *"polygonal intersection"* as being comprised of the *"portion"* of the *"boundary"* of a *"first polygon"* *"<u>located inside</u>"* a *"second polygon"* at an *"intersection"* of the *"boundaries"* of the *"first"* and *"second polygons."* Tanimori has <u>no</u> disclosure about determining whether anything is *"<u>located inside</u>"* (or *"outside"*) objects. Although Tanimori has a process that finds crosspoints of intersecting graphic objects and then reconnects segments of graphic objects, the process in Tanimori does not recognize anything as being *"inside"* the graphic objects. Therefore, Tanimori does not disclose or suggest the <u>first</u> step of Applicant's Claim 1 in which the *"portion"* of the *"boundary"* of the *"first polygon"* which is *"<u>located inside</u>"* the *"second polygon"* at an *"intersection"* of the *"boundaries"* of the *"first"* and *"second polygons"* is the *"first portion"* of the *"boundary"* of a *"polygonal intersection."*

As stated above, the second step of Applicant's Claim 1 is also not disclosed or suggested by Tanimori. The second step in Applicant's Claim 1 recites *"determining"* each *"subsequent portion"* of the *"boundary"* of the *"polygonal intersection"* by *"selecting"* a *"portion"* of the *"boundary"* of either the *"first polygon"* or the *"second*

polygon" that *"connects"* to a *"leading end"* of a *"portion"* of the *"boundary"* of the *"polygonal intersection"* that had *"previously been determined"* and that forms a *"minimum rotation angle. . . therewith."* In the Office Action, the Examiner acknowledged that Tanimori does not disclose the process of selecting a portion of either the boundary the first or second polygon that connects to a leading end of a portion of the boundary of the polygonal intersection that had previously been determined and that forms a minimum rotation angle therewith. Instead, Tanimori discloses a method that involves serially following the relationship determined by reconnecting the segments (Tanimori: column 11, lines 58-64). Tanimori has no disclosure in which angles are computed, compared or otherwise used for any purpose. Because Tanimori uses a substantially different process that does not involve angle comparison, it would not be obvious to modify the Tanimori process to provide the second step of Applicant's Claim 1 in which the *"portion"* of the *"boundary"* of either the *"first polygon"* or the *"second polygon"* that *"connects"* to a *"leading end"* of a *"previously determined portion"* of the *"boundary"* of the *"polygonal intersection"* and that forms a *"minimum rotation angle"* with the *"previously determined portion"* is selected as the *"subsequent portion."*

As explained above, neither step of Applicant's Claim 1 is disclosed or suggested by Tanimori. Therefore, Applicant's Claim 1 is not obvious over this reference and Applicant requests that the rejection of this claim be withdrawn.

Claim 14

Applicant's Claim 14 is an independent claim that relates to a program for determining a polygonal intersection of two polygons. Applicant's Claim 14 recites *"program code"* that *"determines"* a *"first portion"* of a *"boundary"* of the *"polygonal intersection"* as being comprised of a *"portion"* of a *"boundary"* of the *"first polygon" "located inside the second polygon"* at an *"intersection"* of the *"boundary"* of the *"first polygon"* with a *"boundary"* of the *"second polygon."* Applicant's Claim 14 also recites *"program code"* that *"determines each subsequent portion"* of the *"boundary"* of the *"polygonal intersection"* by selecting a *"portion"* of the *"boundary"* of *"either the first polygon or the second polygon"* that connects to a *"leading end"* of a *"portion"* of the

"boundary" of the *"polygonal intersection that had previously been determined"* and that *"forms a minimum rotation angle in a selected direction therewith."*

Applicant's Claim 14 is not obvious over Tanimori for at least the same reasons explained above in connection with Claim 1.

Claims 2-4, 7-13 and 15-17

Applicant's Claims 2-4, 7-13 and 15-17 are dependent claims that depend either directly or indirectly from independent base Claim 1 or 14. These dependent claims distinguish Tanimori at least for the same reasons explained above in connection with their respective base claims. In addition, these dependent claims include limitations that are neither disclosed nor suggested by Tanimori.

B. Applicant's Claims 5, 6 and 18-20 are not obvious over the combination of Tanimori and Blackwell.

In the Office Action (¶ 10), Applicant's independent Claim 18 and dependent Claims 5, 6, 19 and 20 were rejected as obvious over the combination of Tanimori and U.S. Pat. No. 6,208,352 ("Blackwell"). These claims are not obvious over this combination of references at least for the reasons explained below.

Claims 5 and 6

Applicant's Claims 5 and 6 are dependent claims that depend from independent base Claim 1. These claims are allowable at least for the same reasons explained above in connection with Claim 1.

Claim 18

There are several reasons why Applicant's independent Claim 18 is not obvious over the combination of Tanimori and Blackwell. In order for a claim to be obvious over a combination of references, all the limitations in the claim must be disclosed by the references and there must be a suggestion that would motivate one of ordinary skill in the art to combine the references. Applicant's independent Claim 18 is not obvious over the

combination of Tanimori and Blackwell at least for the reason that all the limitations of the claim are not disclosed by this combination of references.

The combination of Tanimori and Blackwell fails to disclose either the step of *"determining a first minimum bounding rectangle that encompasses the first polygon"* or the step of *"determining a second minimum bounding rectangle that encompasses the second polygon."* Neither Tanimori nor Blackwell has any disclosure about the formation of *"minimum bounding rectangles."*

Because Tanimori and Blackwell do not disclose either of the steps of Applicant's Claim 18 in which a *"minimum bounding rectangle"* is determined for the *"first"* and *"second" "polygons"*, the combination of Tanimori and Blackwell also fails to disclose the steps of *"determining that the first minimum bounding rectangle and the second minimum bounding rectangle intersect"* and *"identifying all the links located entirely in a first polygonal area formed by an intersection of the first minimum bounding rectangle and the second minimum bounding rectangle that have at least one node at an endpoint thereof."* Further, since Tanimori and Blackwell fail to disclose the *"identifying"* step, the combination of Tanimori and Blackwell also necessarily fails to disclose the steps of *"associating in a node-link map each node connected to each of the identified links with each of the links connected thereto"* and *"identifying a node from the node-link map that has at least three links connected thereto."*

As explained above in connection with Applicant's Claims 1 and 14, Tanimori fails to disclose anything about determining whether a portion of a boundary of one polygon is inside another polygon. Blackwell also fails to disclose this process. Accordingly, the combination of Tanimori and Blackwell fails to the disclose the step of Applicant's Claim 18 of *"determining which one of said at least three links that belong to the other of polygons is located inside the one of said polygons."*

Also as stated above in connection with Claim 1, Tanimori fails to disclose or suggest any analysis of a *"minimum rotation angle."* Blackwell also fails to disclose any analysis of a *"minimum rotation angle."* Accordingly, the combination of Tanimori and Blackwell also necessarily fails to disclose the step of Applicant's Claim 18 of *"determining"* each *"other link"* of the *"polygonal intersection by selecting . . . that link that forms a minimum rotation angle . . . with the currently known link."*

Applicant has identified at least eight steps in Claim 18 that are not disclosed or suggested by the combination of Tanimori and Blackwell. These differences show that Applicant's Claim 18 represents a significantly different approach from those disclosed or suggested by the combination of Tanimori and Blackwell. The magnitude of these differences confirm that Applicant's Claim 18 would not be obvious in view of the combination of Tanimori and Blackwell.

Claims 19 and 20

Applicant's Claims 19 and 20 are dependent claims that depend from independent base Claim 18. These claims are allowable at least for the same reasons explained above in connection with Claim 18. In addition, these dependent claims include limitations that are neither disclosed nor suggested by the combination of Tanimori and Blackwell.

VII. Extension of time

Included with this response is a petition for an extension of time to respond to the Office Action dated August 2, 2002. Also enclosed is an authorization for payment of the fee associated with this petition.

VIII. Conclusion

Applicant submits that this response addresses all the issues in the Office Action dated August 2, 2002. Therefore, the present application is in condition for allowance. If any issues remain, the Examiner is invited to call the undersigned.

Respectfully submitted,

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MARKED UP VERSIONS

IN THE SPECIFICATION (marked up versions):

At page 7, replace the paragraph starting at line 12 and continuing through line 27 with the following corrected paragraph. —

> Referring to Figures 7A and 7B, in P(A) and P(B), all edges are oriented clockwise. Node N is the starting node since four edges are connected to it, i.e., ae1 and ae2 from P(A), be1 and be2 from P(B). If ae2 is on the right side of be1 and be2, then ae2 is inside P(B) and can be selected as the starting edge of the polygon intersection (as shown in Figure 7A). If ae1 is on the right side of be1 and be2, then ae1 is inside P(B) and can be selected as the starting edge of the polygon intersection. If ae2 and ae1 both are not on the right side of be1 and be2, there is no intersection at N (as shown in Figure 7B). To determine whether ae2 is on the right side of be1 and be2, the process 500 shown in Figure 8 can be used. Using the process 500 in Figure 8, the shape point bp1 is selected from be1, the shape point bp2 is selected from be2 and the shape point ap2 is selected from ae2. These shape points are selected because they are the closest shape points on their respective edges to node N (i.e., point p) although other shape points on these edges may be selected as well. The process 500 in Figure 8 is used to test if point [if] ap2 is on the right side of the line segment bp1_p and p_bp2. According to the process 500, to test the position of a point, P3, relative to a line segment P1P2, calculate c = (x1 - x3)*(y2 - y3) - (x2 - x3) * (y1-y3). If c = 0, P3 is on the line segment P1P2. If c > 0, P3 is on right side of the line segment P1P2. If c < 0, P3 is on left side of the line segment P1P2. If ap2 is on the right side of the line segment bp1_p and p_bp2 [If so], ae2 is to the right of be1 and be2 (as shown in Figure 7A). If not, ae2 is not on the right of be1 and be2 (as shown in Figure 7B).

At page 8, replace the paragraph starting at line 8 and continuing through line 12 with the following corrected paragraph. —

> If there are two or more other links that connect to the clockwise end of the LINK(START), then the link that forms the smallest angle in the

counterclockwise direction from LINK(START) is the next link of the intersection polygon P(I). Data indicating this next link are stored in the list formed to represent the intersection polygon P(I) (Steps 272, 278 and 276).

IN THE CLAIMS (marked up versions):

Please amend Claims 1, 10, 14 and 18, as indicated.

1. (Amended) A method for determining a polygonal intersection of a first polygon and a second polygon comprising:

at an intersection of a boundary of the first polygon with a boundary of the second polygon, determining a first [known] portion of a boundary of the polygonal intersection as comprised of a portion of the boundary of the first polygon that is located inside the second polygon; and

determining each subsequent portion of the boundary of the polygonal intersection [that connects to a current known portion of the boundary of the polygonal intersection] by selecting [that] a portion of the boundary of either the first polygon or the second polygon that connects to a leading end of [the current known] a portion of the boundary of the polygonal intersection that had previously been determined and that forms a minimum rotation angle in a selected direction therewith.

10. (Amended) The method of Claim 1 wherein the portion of the boundary of the first polygon that is located inside the second polygon is determined by determining on which side [comparing an angle formed by the portion of the boundary of the first polygon with portions] of the boundary of the second polygon the portion of the boundary of the first polygon is located [formed by the intersection].

14. (Amended) A program for determining a polygonal intersection of a first polygon and a second polygon, wherein said program is stored on a computer-readable medium, said program comprising:

program code that determines a first [known] portion of a boundary of the polygonal intersection as being comprised of a portion of a boundary of the first polygon

that is located inside the second polygon at an intersection of the boundary of the first polygon with a boundary of the second polygon; and

program code that determines each subsequent portion of the boundary of the polygonal intersection [that connects to a current known portion of the boundary of the polygonal intersection] by selecting [that] a portion of the boundary of either the first polygon or the second polygon that connects to a leading end of [the current known] a portion of the boundary of the polygonal intersection that had previously been determined and that forms a minimum rotation angle in a selected direction therewith.

18. (Amended) A method for determining a polygonal intersection of a first polygon and a second polygon represented by data contained in a geographic database,

wherein a boundary of the first polygon is represented by a first list of links connected at endpoints thereof and the second polygon is represented by a second list of links connected at endpoints thereof,

wherein an endpoint of a link is represented by either a node or a shape point;

wherein each location at which the boundary of the first polygon intersects with the boundary of the second polygon is represented by a node;

wherein the links contained in the first list of links are in an order corresponding to a consistent direction of traversal of the corresponding links representing the boundary of the first polygon;

wherein the links contained in the second list of links are in the order corresponding to the consistent direction of traversal of the corresponding links representing the boundary of the second polygon;

the method comprising the steps of:

determining a first minimum bounding rectangle that encompasses the first polygon;

determining a second minimum bounding rectangle that encompasses the second polygon;

determining that the first minimum bounding rectangle and the second minimum bounding rectangle intersect;

identifying all the links located entirely in a first polygonal area formed by an intersection of the first minimum bounding rectangle and the second minimum bounding rectangle that have at least one node at an endpoint thereof;

associating in a node-link map each node connected to each of the identified links with each of the links connected thereto;

identifying a node from the node-link map that has at least three links connected thereto;

from the order of two of said at least three links that belong to one of the polygons, determining which one of said at least three links that belong to the other of polygons is located inside the one of said polygons;

using the link that is located inside the one of said polygons as a starting link for the polygonal intersection of the first polygon and the second polygon; and

determining each other link of the polygonal intersection by selecting from the links that connect to a currently known link at the end thereof according to the consistent direction of travel that link that forms a minimum rotation angle in a selected direction with the currently known link.